3-5 Solving Systems of Equations in 3 Variables

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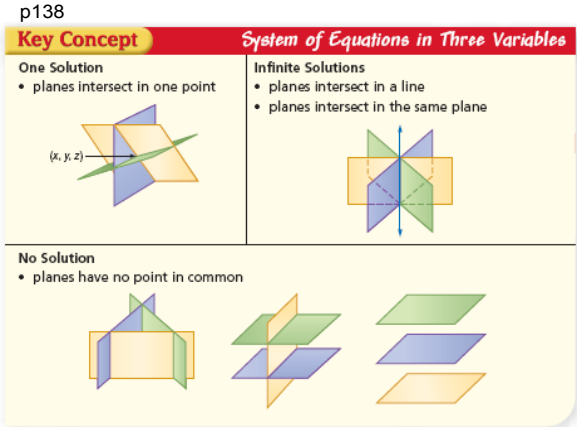

Consistent (at least one solution)
- ordered triple
- line
- plane

Inconsistent (no solution)

True statement
∞ # of solutions (could be a plane or line)

False statement
no solution

ex 1

① $2x - y - z = 1$

② $x + 2y + z = 0$

③ $3x - y - 2z = -1$

① + ② to eliminate z

④ $3x + y = 1$

Now we need to eliminate z from ③

③ + 2×②

$3x - y - 2z = -1$

$+ 2x + 4y + 2z = 0$

⑤ $5x + 3y = -1$

Now solve this system

$3x + y = 1$

$5x + 3y = -1$

$5x + 3(1 - 3x) = -1$ use $y = 1 - 3x$

$5x + 3 - 9x = -1$

$-4x = -4$

$x = 1$

$y = -2$

$z = 3$

$(1, -2, 3)$

ex 2

① $2x + y - 2z = -2$

② $-x - 3y - 2z = 5$

③ $-4x - 2y + 3z = 2$

eliminate x using ① + ③

①×2 + ③

$4x + 2y - 4z = -4$

$-4x - 2y + 3z = 2$

$-z = -2$

$z = 2$

Plug z into ② + ③

-4[$-x - 3y = 9$]

$-4x - 2y = -4$

$4x + 12y = -36$

$10y = -40$

$y = -4$

$(3, -4, 2)$

~~Do:~~

① $2x + y + z = 0$

② $x - 2y + z = 2$

③ $3x - y + 2z = 2$

Add ① + ③ to eliminate y

$5x + 3z = 2$

$5x + 3z = 2$

$0 = 0$

①×2 + ② elim. y

$4x + 2y + 2z = 0$

$x - 2y + z = 2$

∞ # of sol'ns

ex 3:

$x - 3y + 4z = 10$

$2x - y - z = 7$

$x - 4y = 1$

$x = 5$

$(5, 1, 2)$

4($x - 3y + 4z = 10$)

$4x - 12y + 16z = 40$

$8x - 4y - 4z = 28$

$9x - 7y = 38$

$-9x + 36y = -9$

$9x - 7y = 38$

$29y = 29$

$y = 1$

HW
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12, 16, 17, 19, 20